

What is claimed is:

1. An optical apparatus comprising:

at least three ports wherein said ports include at least one input port and  
at least one output port;

- a spectral demultiplexer to spatially separate one or more multi-wavelength input signals received at an input port as a function of wavelength;
- a single invariant optical spatial filter positioned at the demultiplexed image plane to selectively direct each laterally shifted, spatially separated wavelength input signal to an output port as a function of wavelength,
- a means for laterally shifting the spatially separated multi-wavelength input signals relative to the invariant optical spatial filter at the demultiplexed image plane;
- a spectral multiplexer to spatially combine the dispersed multiwavelength output signals and direct said signals into a desired output port.

2. The optical apparatus according to claim 1 wherein all of the input port(s) may be operated as output port(s) and all of the output port(s) may be operated as input port(s).

3. The optical apparatus according to claim 1 having at least two input ports and at least two output ports.

4. The optical apparatus according to claim 1 wherein a one-to-one correspondence exists between each input port and the incident angle of signals from that port at the spatial filter, relative to its surface normal, and between each output port and the angle of signals deflected to that port from the spatial filter, relative to its surface normal.

5. The optical apparatus according to claim 4 in which beams of light traversing from one or more input ports to the fixed optical spatial filter and from the fixed optical spatial filter to one or more output ports intersect a optical pupil in non-overlapping spots.
6. The optical apparatus according to claim 1 wherein the apparatus is an anamorphic optical imaging system.
7. The optical apparatus according to claim 1 wherein the means for laterally shifting the spatially separated multi-wavelength input signals relative to the invariant optical spatial filter at the demultiplexed image plane is a beam steerer directing the optical signals..
8. The optical apparatus according to claim 1 wherein the means for laterally shifting the spatially separated multi-wavelength input signals relative to the invariant optical spatial filter at the demultiplexed image plane is a lateral translator positioning the invariant optical spatial filter.
9. The optical apparatus according to claim 7 wherein the beam steerer includes a tilttable reflective diffraction grating.
10. The optical apparatus according to claim 7 wherein the beam steerer includes a tilttable mirror.
11. The optical apparatus according to claim 7 wherein the beam steerer includes a lens for converting angular shift into lateral shift.
12. The optical apparatus according to claim 11 wherein the multiplexer includes the beam steerer lens.

13. The optical apparatus according to claim 1 wherein the spectral de-multiplexer and the spectral multiplexer includes a diffraction grating.
14. The optical apparatus according to claim 1 wherein the beam steerer includes:
  - a position sensor for detecting the position of the beam steerer.
15. The optical apparatus according to claim 4 wherein the spatial filter includes a reflective field surrounding other reflective surfaces whose surface normals are tilted relative to the surface normal of the reflective field.
16. The optical apparatus according to claim 15 further comprising:
  - a reconfigurator that varies the spatial position of the spectrally dispersed input signals relative to the spatial filter;
    - such that switched signals transition from a surface at one angle to a surface at a different angle while non-switched signals remain on a continuous surface of substantially fixed angle and thus are not interrupted during the reconfiguration.
17. The optical apparatus according to claim 4 wherein the fixed spatial filter includes one or more diffraction gratings of different spatial frequency positioned within a diffractive field grating of a different spatial frequency..
18. The optical apparatus according to claim 1 further comprising:
  - a reconfigurator that varies the spatial position of the spectrally dispersed input signals relative to the spatial filter;
    - such that switched signals transition from a grating at one spatial frequency to a grating at a different spatial frequency while non-switched signals remain on a continuous grating of substantially fixed spatial frequency and thus are not interrupted during the reconfiguration.

19. The optical apparatus according to claim 9, wherein the grating is a selectively tilttable MEMS grating.

20. The optical apparatus according to claim 10, wherein the mirror is a selectively tilttable, opto-mechanical MEMS tilt mirror

21. The optical apparatus according to claim 1 further comprising a means for determining the position of the spectrum on the spatial filter.
22. The optical apparatus according to claim 21, wherein the position determining means includes a detector that determines the position of a signal on the spatial filter.
23. The optical apparatus according to claim 1, wherein the spatial filter includes a director that directs a portion of the light striking the filter.
24. The optical apparatus according to claim 23 wherein said director includes an aperture.
25. The optical apparatus according to claim 24 wherein said director includes a tilted mirror or grating.
26. In an optical switch having a plurality of ports, a method of switching a received multi-wavelength signal from one of said ports to another of said ports, the method comprising the steps of:
  - spatially separating the multi-wavelength signal as a function of wavelength;
  - laterally shifting the spatially separated multi-wavelength signal at the demultiplexed image plane relative to an invariant spatial filter;
  - selectively directing, each shifted spatially separated wavelength input signal to a desired port as a function of wavelength; and
  - spatially combining the dispersed multiwavelength output signals such that desired multiwavelength signals are switched from one of the ports to another of said ports.

27. The method according to claim 26 further comprising the steps of:
- switching all of the signals to a first output port;
  - reconfiguring the position of the signals relative to an invariant spatial filter while directing all of the signals into the first output port; and
  - switching a selectable portion of the signals into a second output port while directing the remainder of the signals into the first output port.

28. The method according to claim 26 further comprising the steps of:
- changing the number of signals (equivalently, the spectral bandwidth of the signal) directed into one or more output ports while not interrupting those signals initially directed into said output ports that are not being switched from one output port to another .